PATENT ABSTRACTS OF JAPAN

(11)Publication number : 04-305981
(43)Date of publication of application : 28.10.1992

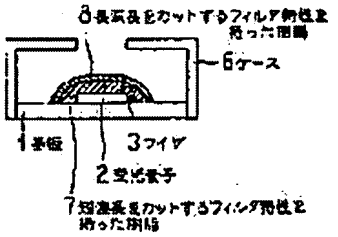
(51)Int.Cl. H01L 31/10
H01L 23/29
H01L 23/31

(21)Application number : 03-070169
(22)Date of filing : 02.04.1991

(71)Applicant : SONY CORP
(72)Inventor : IKENAGA KAZUO
TAKAHASHI MASAYUKI
TAWARA HIROKI

(54) PHOTOSENSITIVE APPARATUS

(57)Abstract:
PURPOSE: To provide a photosensitive apparatus which can prevent malfunction by noises.
CONSTITUTION: A photosensitive element 2 is mounted on a substrate 1 and a wire 3 is bonded thereto. Thereafter, a kind of dye having a filter characteristic for cutting off the light having the short and long wavelengths other than the wavelength λ1 of the predetermined light is mixed into resin, the photosensitive element 2 and wire 3 are sealed with such resins 7, 8 for the complete sealing with a package. Since the light, which may be a noise element, having the wavelength other than that of the desired light can be cut off and the processing can be done in the same process as that for sealing a conventional photosensitive element, an individual apparatus is no longer necessary in the individual process, so much realizing cost reaction.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

PTO 07-6208

CC=JP
DATE=19921028
KIND=A
PN=04305981

LIGHT RECEIVING DEVICE
[JYUKOU SOUCHI]

IKENAGA KAZUO

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C.
AUGUST 2007
TRANSLATED BY SCHREIBER TRANSLATIONS INC.

PUBLICATION COUNTRY	(10):	JP
DOCUMENT NUMBER	(11):	H04305981
DOCUMENT KIND	(12):	A
PUBLICATION DATE	(43):	19921028
APPLICATION NUMBER	(21):	H03070169
APPLICATION DATE	(22):	19910402
INTERNATIONAL CLASSIFICATION	(51):	H 01 L 31/10 23/29 23/31
PRIORITY COUNTRY	(33):	
PRIORITY NUMBER	(31):	
PRIORITY DATE	(32):	

INVENTOR(S)	(72):	IKENAGA KAZUO TAKAHASHI MASAYUKI TAWARA HIROKI
APPLICANT(S)	(71):	SONY CORP.

DESIGNATED CONTRACTING STATES	(81):	

TITLE (54): LIGHT RECEIVING DEVICE

FOREIGN TITLE [54A]: JUKOU SOUCHI

[Scope of the Claims]

[Claim 1] A light receiving device that is characterized by a photo-receiving element, with spectral sensitivity that extends from the visible light region to the near infrared light region, that is encapsulated in a transparent resin which is mixed with a dye that absorbs wavelengths other than the desired light wavelengths.

[Claim 2] A light receiving device as claimed in Claim 1 that is characterized by a photo-receiving element, with spectral sensitivity that extends from the visible light region to the near infrared light region, that is encapsulated in a transparent resin which is mixed with a dye that absorbs wavelengths that are shorter than the desired light wavelengths and a dye that absorbs wavelengths that are longer than the desired light wavelengths.

[Claim 3] A light receiving device as claimed in Claim 1 that is characterized by a photo-receiving element, with spectral sensitivity that extends from the visible light region to the near infrared light region, that is double encapsulated in a transparent resin which is mixed with a dye that absorbs wavelengths that are shorter than the desired light wavelengths and a transparent resin which is

mixed with a dye that absorbs wavelengths that are longer than the desired light wavelengths.

[Claim 4] A light receiving device as claimed in Claim 2 and Claim 3 that is characterized by there being a dye that absorbs cut-off wavelengths that are wavelengths shorter than near 840 nm and a dye that absorbs cut-off wavelengths that are wavelengths longer than near 1050 nm.

[Detailed Explanation of the Invention]

[0001]

[Field of the Invention] This invention pertains to a light receiving device that is used for infrared ray remote control devices and the like.

[0002]

[Prior Art] A prior art light receiving device, as shown in Figure 4, for example, is a structure with a light receiving device 2 such as a PIN diode mounted on a substrate 1, wire 3 protected by encapsulating in a transparent resin 4 after bonding a wire 3, and, beyond that, being encapsulating in a package 6 that is equipped with a filter 5 that has cut-off properties (for example, a cut-off wavelength of 840 nm) for light of shorter wavelengths than the desired light wavelength $[lambda]_1$ as shown in Figure 3B, for example.

[0003]

[Problems to be Solved by the Invention] However, the wavelength-sensitivity property of a light receiving element 2 such as a PIN diode, as shown in Figure 3A, is a highly sensitive property for a wavelength $[lambda]_1$, the wavelength-sensitivity property after cutting the light of a short wavelength by filter 5 becomes a property as shown by the broken line a of Figure 3D in a long wavelength region, and the light of wavelengths shorter than the wavelength $[lambda]_1$ is cut by filter 5, but light of wavelengths longer than the wavelength $[lambda]_1$ are cut by the sensitivity of light receiving element 2. The wavelength-sensitivity property of a light receiving device like this has a peak sensitivity near the wavelength $[lambda]_1$, but there are cases wherein some light of wavelengths longer than the wavelength $[lambda]_1$ is noise and the like for wavelength $[lambda]_1$. For example, the sensitivity of 1050 nm decreases only to the extent of 50% of the peak output, and this becomes noise due to the infrared light rays that are generated by a fluorescent lamp or the like undergoing photo-electric conversion, and malfunctions and the like occur in electronic devices when electronic devices and the like are controlled by light receiving devices like this. Further, prior art light

receiving devices have a high cost since there is a process for only that of encapsulating since the process of resin encapsulating of light receiving element 2 as aforementioned and a process of establishing a filter 5 are individual process and the cost becomes high. This invention is such as solving problems like this.

[0004]

[Means for Solving the Problems] Therefore, this invention is such as having a light receiving element, with a spectral sensitivity that extends from the visible light region to the near infrared region, encapsulated in a transparent resin that is mixed with a dye that absorbs wavelengths other than the desired light wavelength.

[0005]

[Utilization] Therefore, a light receiving device of this invention can cut wavelengths other than the desired light wavelengths, and the reliability during operation is improved.

[0006]

[Examples] Below, examples of this invention are discussed along with the figures. Figure 1 and Figure 2 are simplified cross-sectional diagrams of light receiving devices that are 1st and 2nd examples of this invention; Figure 3 is a curve diagram for explaining this invention,

the same figure A shows the wavelength-sensitivity property (output property) of a light receiving element, the same figure B shows the filter property that cuts a short wavelength, the same figure C shows a filter property that cuts a long wavelength, and the same figure D shows the wavelength-sensitivity property (output property) of a light receiving device when passing through a filter.

[0007] First, a light receiving device of this invention is explained using Figure 1. Identical symbols are used for the identical components of the prior art light receiving device that is shown in Figure 4. For example, a light receiving element 2 like a PIN diode is mounted on a substrate 1 and wire 3 is bonded, without changing the structure that is encased by package 6 for a prior art light receptor; in this example, a light receiving element 2 is double encapsulated in two layers of a resin 7 that has a filter property that cuts short wavelengths that are shown in Figure 3B and a resin 8 that has a filter property that cuts long wavelengths that are shown in Figure 3C.

[0008] The resins that are used for these resins 7 and 8 are transparent and the filter properties are determined by the properties of the dyes. When the desired light wavelength $[lambda]_1$ is 940 nm, the resin 7 with a

filter property that cuts short wavelengths can be obtained by mixing dye that absorbs wavelengths near 840 nm and less such as, for example, Sumitomo Chemical Co. product OPT-NIR-840S, in a transparent resin. Further, the resin 8 with a filter property that cuts long wavelengths can be obtained by mixing a dye that absorbs wavelengths near 1050 nm and above such as, for example, the sample offering of Nagase & Company, Ltd., in a transparent resin.

[0009] The permeabilities of Figure 3B and Figure 3C are combined properties from encapsulating a light receiving element 2 in two types of resins 7 and 8 with different filter properties as aforementioned, and the light receiving device exhibits the output property that is shown by the solid line b of Figure 3D. This is not due to the properties of the light receiving element 2, but the output properties can be realized by only the properties of resins 7 and 8 which are filters, and the ability

/3

to cut light of destructive wavelengths near the desired light wavelength $[lambda]_1$ is exhibited.

[0010] Next, a 2nd example of Figure 2 is explained. in the case of this example, dyes of properties that are shown in Figure 3B and Figure 3C, for example, dyes of the aforementioned 2 types, are simultaneously mixed in an

encapsulation-use resin and the application example has light receiving element 2 encapsulated in that mixed resin 9. A light receiving device of this 2nd example also obtains an output property like that of a light receiving device of the aforementioned 1st example. According to the structure of a light receiving device of this example, compared to the 1st example, the two types of dyes are simultaneously mixed in the same resin, and there is the strong point of being able to omit that process only due to the light receiving element 2 being encapsulated at one time.

[0011]

[Effects of the Invention] As clarified from the explanation above, a light receiving device of this invention can cut light of a destructive wavelength near a desired light wavelength $[lambda]_1$ by having a filter effect from a resin with a light receiving element encapsulated, therefore, malfunctions due to noise and the like of devices that are controlled by light receiving devices can be prevented, and the reliability of the system entirety can be improved just by that. Also, an individual device by an individual process is not required since there can be a process that is the same process for the processes of encapsulating the light receiving element. Therefore, a

cost decrease can be anticipated by that alone.

[Simple Explanation of the Figures]

[Figure 1] is a simplified cross-sectional diagram of a light receiving device that is a 1st example of this invention.

[Figure 2] is a simplified cross-sectional diagram of a light receiving device that is a 2nd example of this invention.

[Figure 3] is a curve diagram for explaining this invention; the same figure A shows the wavelength-sensitivity property (output property) of a light receiving element; the same figure B shows a filter property that cuts short wavelengths; the same figure C shows a filter property that cuts long wavelengths; and, the same figure D shows the wavelength-sensitivity property (output property) of a light receiving device when passing through a filter.

[Figure 4] is a simplified cross-sectional diagram that shows a prior light receiving device.

[Explanation of the Symbols]

1 substrate

2 light receiving element

3 wire

4 encapsulating resin

5 filter

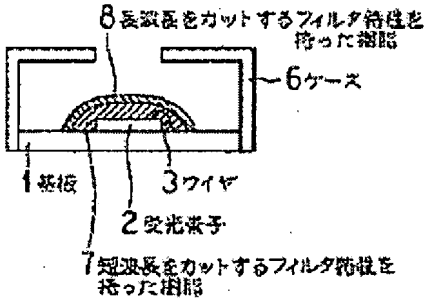
6 case

7 resin with filter property that cuts short wavelengths

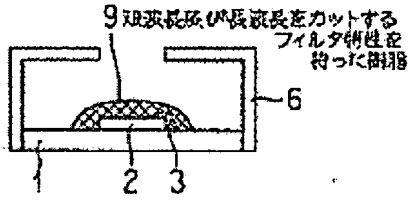
8 resin with a filter property that cuts long wavelengths

9 resin with filter properties that cut short wavelengths and long wavelengths

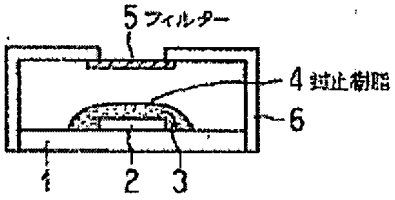
【図1】


8 長波長をカットするフィルタ特性を持った樹脂
6 ケース
1 基板
3 ワイヤ
2 受光素子
7 短波長をカットするフィルタ特性を持った樹脂

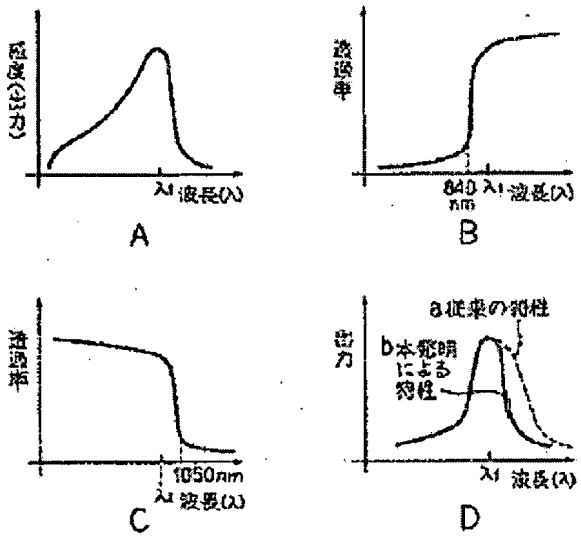
【図2】


9 IR波長及び長波長をカットするフィルタ特性を持った樹脂
6
1
2
3

【図4】


5 フィルター
4 封止樹脂
6
1
2
3

【図３】


感度(出力)
λ1 波長(λ)
A
透過率
840 nm
λ1 波長(λ)
B
相対出力
1050nm
λ1 波長(λ)
C
出力
a従来の特性
b本発明による特性
λ1 波長(λ)
D

[Key to Figure 1]

1 substrate

2 light receiving element

3 wire

6 case

7 resin with a filter property that cuts short wavelengths

8 resin with a filter property that cuts long wavelengths

[Key to Figure 2]

9 resin with filter properties that cut short wavelengths and long wavelengths

[Key to Figure 3]

A

[axis] wavelength ($[lambda]_1$)

[ordinate] sensitivity (output)

B

[axis] wavelength ($[lambda]_1$)

[ordinate] permeability

C

[axis] wavelength ($[lambda]_1$)

[ordinate] permeability

D

[axis] wavelength (λ_1)

[ordinate] output

a property of prior [art]

b property according to the present invention

[Key to Figure 4]

4 encapsulating resin

5 filter

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 04-305981
(43)Date of publication of application : 28.10.1992

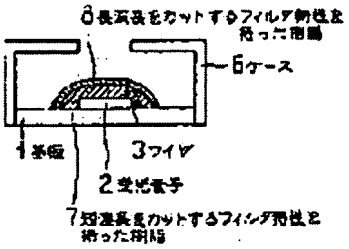
(51)Int.Cl. H01L 31/10
H01L 23/29
H01L 23/31

(21)Application number : 03-070169
(22)Date of filing : 02.04.1991

(71)Applicant : SONY CORP
(72)Inventor : IKENAGA KAZUO
TAKAHASHI MASAYUKI
TAWARA HIROKI

(54) PHOTOSENSITIVE APPARATUS

(57)Abstract:
PURPOSE: To provide a photosensitive apparatus which can prevent malfunction by noises.
CONSTITUTION: A photosensitive element 2 is mounted on a substrate 1 and a wire 3 is bonded thereto. Thereafter, a kind of dye having a filter characteristic for cutting off the light having the short and long wavelengths other than the wavelength λ1 of the predetermined light is mixed into resin, the photosensitive element 2 and wire 3 are sealed with such resins 7, 8 for the complete sealing with a package. Since the light, which may be a noise element, having the wavelength other than that of the desired light can be cut off and the processing can be done in the same process as that for sealing a conventional photosensitive element, an individual apparatus is no longer necessary in the individual process, so much realizing cost reaction.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

PTO 07-6208

CC=JP
DATE=19921028
KIND=A
PN=04305981

LIGHT RECEIVING DEVICE
[JYUKOU SOUCHI]

IKENAGA KAZUO

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C.
AUGUST 2007
TRANSLATED BY SCHREIBER TRANSLATIONS INC.

PUBLICATION COUNTRY	(10):	JP
DOCUMENT NUMBER	(11):	H04305981
DOCUMENT KIND	(12):	A
PUBLICATION DATE	(43):	19921028
APPLICATION NUMBER	(21):	H03070169
APPLICATION DATE	(22):	19910402
INTERNATIONAL CLASSIFICATION	(51):	H 01 L 31/10 23/29 23/31
PRIORITY COUNTRY	(33):	
PRIORITY NUMBER	(31):	
PRIORITY DATE	(32):	

INVENTOR(S)	(72):	IKENAGA KAZUO TAKAHASHI MASAYUKI TAWARA HIROKI
APPLICANT(S)	(71):	SONY CORP.

DESIGNATED CONTRACTING STATES	(81):	

TITLE (54): LIGHT RECEIVING DEVICE

FOREIGN TITLE [54A]: JUKOU SOUCHI

[Scope of the Claims]

[Claim 1] A light receiving device that is characterized by a photo-receiving element, with spectral sensitivity that extends from the visible light region to the near infrared light region, that is encapsulated in a transparent resin which is mixed with a dye that absorbs wavelengths other than the desired light wavelengths.

[Claim 2] A light receiving device as claimed in Claim 1 that is characterized by a photo-receiving element, with spectral sensitivity that extends from the visible light region to the near infrared light region, that is encapsulated in a transparent resin which is mixed with a dye that absorbs wavelengths that are shorter than the desired light wavelengths and a dye that absorbs wavelengths that are longer than the desired light wavelengths.

[Claim 3] A light receiving device as claimed in Claim 1 that is characterized by a photo-receiving element, with spectral sensitivity that extends from the visible light region to the near infrared light region, that is double encapsulated in a transparent resin which is mixed with a dye that absorbs wavelengths that are shorter than the desired light wavelengths and a transparent resin which is

mixed with a dye that absorbs wavelengths that are longer than the desired light wavelengths.

[Claim 4] A light receiving device as claimed in Claim 2 and Claim 3 that is characterized by there being a dye that absorbs cut-off wavelengths that are wavelengths shorter than near 840 nm and a dye that absorbs cut-off wavelengths that are wavelengths longer than near 1050 nm.

[Detailed Explanation of the Invention]

[0001]

[Field of the Invention] This invention pertains to a light receiving device that is used for infrared ray remote control devices and the like.

[0002]

[Prior Art] A prior art light receiving device, as shown in Figure 4, for example, is a structure with a light receiving device 2 such as a PIN diode mounted on a substrate 1, wire 3 protected by encapsulating in a transparent resin 4 after bonding a wire 3, and, beyond that, being encapsulating in a package 6 that is equipped with a filter 5 that has cut-off properties (for example, a cut-off wavelength of 840 nm) for light of shorter wavelengths than the desired light wavelength $[lambda]_1$ as shown in Figure 3B, for example.

[0003]

[Problems to be Solved by the Invention] However, the wavelength-sensitivity property of a light receiving element 2 such as a PIN diode, as shown in Figure 3A, is a highly sensitive property for a wavelength $[lambda]_1$, the wavelength-sensitivity property after cutting the light of a short wavelength by filter 5 becomes a property as shown by the broken line a of Figure 3D in a long wavelength region, and the light of wavelengths shorter than the wavelength $[lambda]_1$ is cut by filter 5, but light of wavelengths longer than the wavelength $[lambda]_1$ are cut by the sensitivity of light receiving element 2. The wavelength-sensitivity property of a light receiving device like this has a peak sensitivity near the wavelength $[lambda]_1$, but there are cases wherein some light of wavelengths longer than the wavelength $[lambda]_1$ is noise and the like for wavelength $[lambda]_1$. For example, the sensitivity of 1050 nm decreases only to the extent of 50% of the peak output, and this becomes noise due to the infrared light rays that are generated by a fluorescent lamp or the like undergoing photo-electric conversion, and malfunctions and the like occur in electronic devices when electronic devices and the like are controlled by light receiving devices like this. Further, prior art light

receiving devices have a high cost since there is a process for only that of encapsulating since the process of resin encapsulating of light receiving element 2 as aforementioned and a process of establishing a filter 5 are individual process and the cost becomes high. This invention is such as solving problems like this.

[0004]

[Means for Solving the Problems] Therefore, this invention is such as having a light receiving element, with a spectral sensitivity that extends from the visible light region to the near infrared region, encapsulated in a transparent resin that is mixed with a dye that absorbs wavelengths other than the desired light wavelength.

[0005]

[Utilization] Therefore, a light receiving device of this invention can cut wavelengths other than the desired light wavelengths, and the reliability during operation is improved.

[0006]

[Examples] Below, examples of this invention are discussed along with the figures. Figure 1 and Figure 2 are simplified cross-sectional diagrams of light receiving devices that are 1st and 2nd examples of this invention; Figure 3 is a curve diagram for explaining this invention,

the same figure A shows the wavelength-sensitivity property (output property) of a light receiving element, the same figure B shows the filter property that cuts a short wavelength, the same figure C shows a filter property that cuts a long wavelength, and the same figure D shows the wavelength-sensitivity property (output property) of a light receiving device when passing through a filter.

[0007] First, a light receiving device of this invention is explained using Figure 1. Identical symbols are used for the identical components of the prior art light receiving device that is shown in Figure 4. For example, a light receiving element 2 like a PIN diode is mounted on a substrate 1 and wire 3 is bonded, without changing the structure that is encased by package 6 for a prior art light receptor; in this example, a light receiving element 2 is double encapsulated in two layers of a resin 7 that has a filter property that cuts short wavelengths that are shown in Figure 3B and a resin 8 that has a filter property that cuts long wavelengths that are shown in Figure 3C.

[0008] The resins that are used for these resins 7 and 8 are transparent and the filter properties are determined by the properties of the dyes. When the desired light wavelength $[lambda]_1$ is 940 nm, the resin 7 with a

filter property that cuts short wavelengths can be obtained by mixing dye that absorbs wavelengths near 840 nm and less such as, for example, Sumitomo Chemical Co. product OPT-NIR-840S, in a transparent resin. Further, the resin 8 with a filter property that cuts long wavelengths can be obtained by mixing a dye that absorbs wavelengths near 1050 nm and above such as, for example, the sample offering of Nagase & Company, Ltd., in a transparent resin.

[0009] The permeabilities of Figure 3B and Figure 3C are combined properties from encapsulating a light receiving element 2 in two types of resins 7 and 8 with different filter properties as aforementioned, and the light receiving device exhibits the output property that is shown by the solid line b of Figure 3D. This is not due to the properties of the light receiving element 2, but the output properties can be realized by only the properties of resins 7 and 8 which are filters, and the ability

/3

to cut light of destructive wavelengths near the desired light wavelength $[lambda]_1$ is exhibited.

[0010] Next, a 2nd example of Figure 2 is explained. in the case of this example, dyes of properties that are shown in Figure 3B and Figure 3C, for example, dyes of the aforementioned 2 types, are simultaneously mixed in an

encapsulation-use resin and the application example has light receiving element 2 encapsulated in that mixed resin 9. A light receiving device of this 2nd example also obtains an output property like that of a light receiving device of the aforementioned 1st example. According to the structure of a light receiving device of this example, compared to the 1st example, the two types of dyes are simultaneously mixed in the same resin, and there is the strong point of being able to omit that process only due to the light receiving element 2 being encapsulated at one time.

[0011]

[Effects of the Invention] As clarified from the explanation above, a light receiving device of this invention can cut light of a destructive wavelength near a desired light wavelength $[lambda]_1$ by having a filter effect from a resin with a light receiving element encapsulated, therefore, malfunctions due to noise and the like of devices that are controlled by light receiving devices can be prevented, and the reliability of the system entirety can be improved just by that. Also, an individual device by an individual process is not required since there can be a process that is the same process for the processes of encapsulating the light receiving element. Therefore, a

cost decrease can be anticipated by that alone.

[Simple Explanation of the Figures]

[Figure 1] is a simplified cross-sectional diagram of a light receiving device that is a 1st example of this invention.

[Figure 2] is a simplified cross-sectional diagram of a light receiving device that is a 2nd example of this invention.

[Figure 3] is a curve diagram for explaining this invention; the same figure A shows the wavelength-sensitivity property (output property) of a light receiving element; the same figure B shows a filter property that cuts short wavelengths; the same figure C shows a filter property that cuts long wavelengths; and, the same figure D shows the wavelength-sensitivity property (output property) of a light receiving device when passing through a filter.

[Figure 4] is a simplified cross-sectional diagram that shows a prior light receiving device.

[Explanation of the Symbols]

1 substrate

2 light receiving element

3 wire

4 encapsulating resin

5 filter

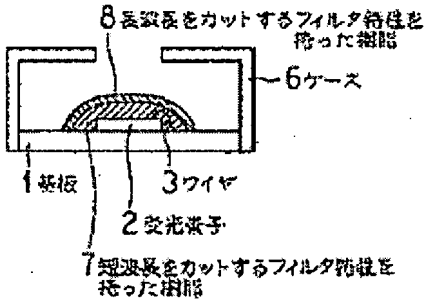
6 case

7 resin with filter property that cuts short wavelengths

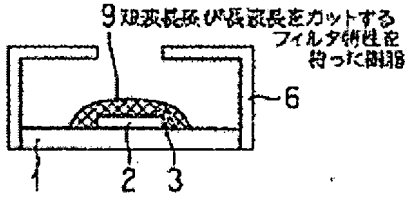
8 resin with a filter property that cuts long wavelengths

9 resin with filter properties that cut short wavelengths and long wavelengths

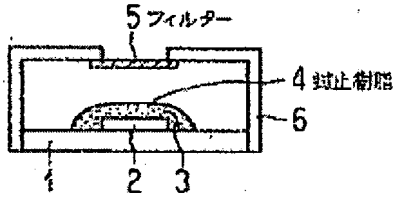
【図1】


8 長波長をカットするフィルタ特性を
持った樹脂
6 ケース
1 基板
3 ワイヤ
2 受光素子
7 短波長をカットするフィルタ特性を
持った樹脂

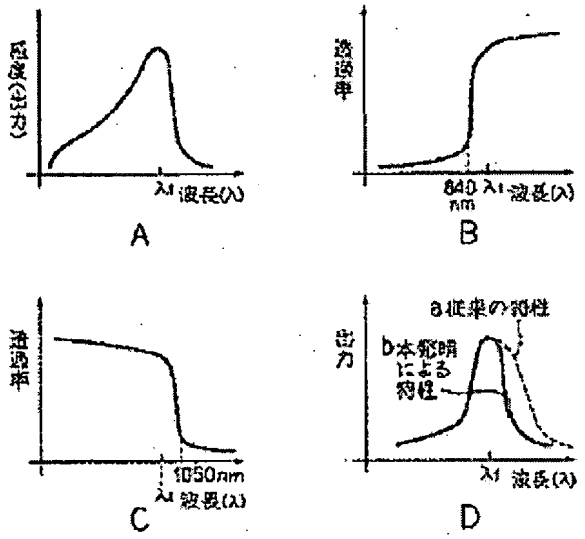
【図2】


9 短波長及び長波長をカットする
フィルタ特性を
持った樹脂
6
1
2
3

【図4】


5 フィルター
4 封止樹脂
6
1
2
3

【図３】


強度(任意)
λ1 波長(λ)
A
透過率
840 nm
λ1 波長(λ)
B
透過率
1050nm
λ1 波長(λ)
C
出力
a従来の特性
b本発明による特性
λ1 波長(λ)
D

[Key to Figure 1]

1 substrate

2 light receiving element

3 wire

6 case

7 resin with a filter property that cuts short wavelengths

8 resin with a filter property that cuts long wavelengths

[Key to Figure 2]

9 resin with filter properties that cut short wavelengths and long wavelengths

[Key to Figure 3]

A

[axis] wavelength ($[lambda]_1$)

[ordinate] sensitivity (output)

B

[axis] wavelength ($[lambda]_1$)

[ordinate] permeability

C

[axis] wavelength ($[lambda]_1$)

[ordinate] permeability

D

[axis] wavelength ([lambda]$_1$)

[ordinate] output

a property of prior [art]

b property according to the present invention

[Key to Figure 4]

4 encapsulating resin

5 filter